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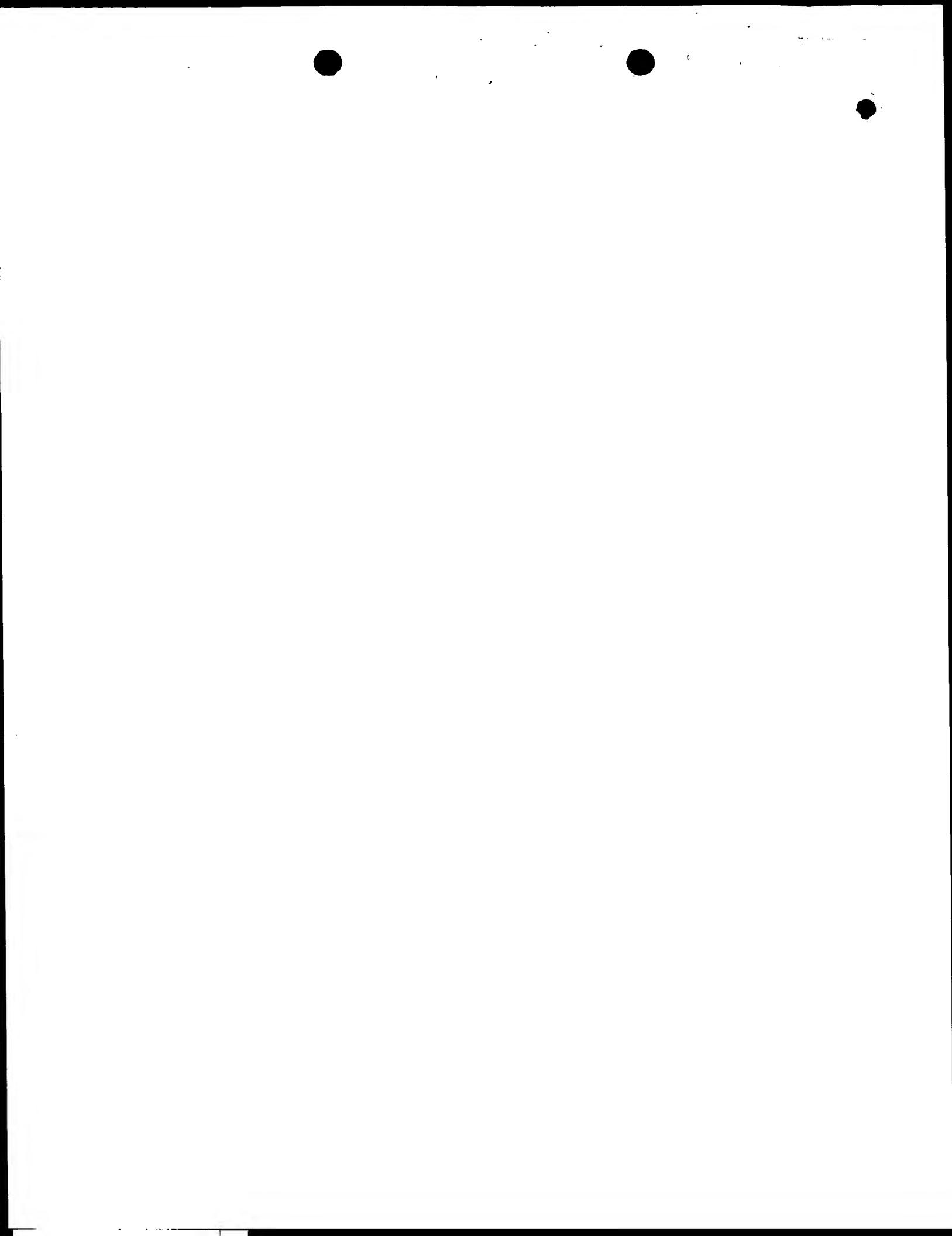
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The Patent Office

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1. Your reference	AHT0104		
2. Patent application number (The Patent Office will fill in this part)	15 SEP 1999		
3. Full name, address and postcode of the or of each applicant (underline all surnames)	ANDREW JOSEPH JOHN <u>MCCARTHY</u> & CHARLES <u>76578770</u> PETER <u>GATES</u> , <u>77404</u> <u>34001</u> GORSE DENE, RISSINGTON ROAD, BOURTON-ON-THE-WATER, GLOUCESTERSHIRE, GL54 2DX		
Patents ADP number (if you know it)			
If the applicant is a corporate body, give the country/state of its incorporation	UNITED KINGDOM		
4. Title of the invention	IMPROVEMENTS RELATING TO CARGO SECURITY		
5. Name of your agent (if you have one)	Barker Brettell 138 Hagley Road Edgbaston Birmingham B16 9PW		
“Address for service” in the United Kingdom to which all correspondence should be sent (including the postcode)			
Patents ADP number (if you know it)	7442494002 ✓		
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number	Country	Priority application number (if you know it)	Date of Filing (day/month/year)
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing (day/month/year)
8. Is a statement of inventorship and of right to grant of a patent required in support of this request (Answer 'Yes' if: a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))	NO		

# Patents Form 1/77

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Description 9 + 9

Claim(s)

Abstract

Drawing(s) 1 + 1

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination  
(*Patents Form 9/77*)

Request for substantive examination  
(*Patents Form 10/77*)

Any other documents  
(*please specify*)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Barker Brettell

Date

13.09.99

12. Name and daytime telephone number of person to contact in the United Kingdom

Mr. A.H. Tebbitt

Tel: 0121 456 1364

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## IMPROVEMENTS RELATING TO CARGO SECURITY

This invention relates to cargo security and this specification has as its particular object to amplify the specification of co-pending application number 9910754.2, detailing developments and improvements to the 5 material contained therein.

As detailed in application number 9910754.2 security problems may occur with luggage or other types of cargo either before or during transit. These may, for example, involve tampering with the luggage or other items of cargo to insert illegal drugs therein. This problem makes the 10 provision of a cargo closure for identifying and securely closing cargo highly desirable.

This cargo closure advantageously comprises a permanently closeable tie attached to a data carrier. In order to open the luggage the tie must be destroyed. It therefore provides a ready indication of whether there has 15 been any attempt to tamper with the cargo or luggage.

It is particularly important to take notice of tampering when the contents of the cargo or luggage is hazardous. Such tampering, or indeed merely the wrong handling, may disturb the hazardous contents making a spillage more likely.

20 Other related security problems may also occur during transit of cargo. A cargo container or piece of luggage may become mis-directed, delayed or separated from its consignment. If this piece of cargo is mis-directed to a store with many other similar pieces it will be difficult to distinguish and may become permanently lost.

25 Furthermore when cargo is transported a number of pieces of paperwork are often attached. These are referred to in application number 9910754.2

as a travel ticket. A travel ticket may comprise any travel document and includes a passenger ticket in the case of luggage items. Alternatively the travel document may comprise one or more of a bill of lading, a cargo manifest and / or a delivery note in the case of industrial cargo items.

5 These are commonly taped to the side of the cargo container in, for example, a plastic pocket and may not withstand rough handling or unfortunate accidents such as submersion in water.

It is an object of this invention to provide an improved cargo closure which addresses the problems set out above.

10 According to a first aspect of the present invention there is provided a cargo closure comprising a permanently closeable tie attached to a data carrier, wherein the cargo closure is operable to emit a signal upon a trigger.

This signal may comprise a simple audio or visual alarm or a radio alarm 15 and the trigger event may occur when the cargo container is tampered with. Alternatively or additionally the trigger could comprise a clock which indicates a time by which the cargo should have been delivered so that the cargo closure emits an alarm if it has been delayed.

According to a second aspect of the present invention there is provided a cargo closure comprising a permanently closeable tie attached to a data 20 carrier wherein the data carrier comprises a magnetic storage medium.

This medium may conveniently store such details as the owners name and address, the name and address of a sender and / or a recipient, the route that should be taken by the item of cargo; details of companies and / or 25 people responsible for the safe transit of the cargo; and / or a cargo manifest or delivery note containing details of the cargo contents. The nature of the cargo contents, such as whether or not they are perishable

may be indicated. If the cargo contains hazardous items the storage medium may advantageously contain information regarding the nature of the hazard and instructions for dealing with accidental release of the contents. In this case the cargo closure may advantageously be brightly 5 coloured or contain another visible indication, such as a hazard symbol, of the nature of its contents.

Preferably the storage medium may be reprogrammed, for example with the information that the cargo container has reached an intermediate stage of its journey.

10 Advantageously the data carrier comprises a removable smart card containing a chip on which any or all of the above information may be stored.

Preferably the first and second aspects of the invention may be combined so that the signal may contain information regarding the nature of the 15 cargo contents etc.. In this case the trigger may comprise an activating signal generated by, for example, a warehouser who is sweeping the activating signal across an array of cargo in order to collate information pertinent to that cargo. In this case the information is transmitted onto a handheld electronic device carried by the warehouser. It may then be 20 compared to information stored in a central database which may, for example, specify which cargo containers should be in the warehouse.

Preferably the cargo closure is operatively associated with a mini-transmitter adapted to enable remote tracking of the location of the cargo container. This transmitter may signal the presence of the cargo container 25 to an appropriate receiving unit. Advantageously a buddy system is operated where associated cargo containers track each other. In this case the transmitter may transmit to a receiver contained in an accompanying

cargo container. If regular transmissions are not contained, signifying that the cargo containers have been separated, an alarm may be sounded, and the information noted on the smart card chip.

Preferably the cargo closure is operatively associated with a GPS type 5 system on the cargo container which is equipped to broadcast its location, following a trigger from the cargo closure, so that the cargo container is easy to locate.

The present invention includes a travel pack comprising at least one of the above cargo closures and a travel document. The travel document 10 accompanies the travel pack and contains information relevant to the cargo, such as one or more of its source and / or destination, its contents, any items accompanying it etc.. Advantageously the data carrier may be folded over and the travel document is transported in the pocket thus formed.

15 A preferred embodiment of the invention will now be described by way of example only with reference to Figures 1 to 3 of copending application number 9910754.2 and the accompanying drawing in which:

**Figure 4** shows schematically a cargo closure with attached smart card.

20 A cargo closure 1 comprising a permanently closeable tie 2 and a data carrier 3 is moulded from a suitable polymeric material. Inset into and running through a strap of the tie 2 is a strip 38 of a conducting material. Another strip 39 of conducting material is also incorporated into a base member 21 so that when a free end of the strap is passed through a hole in 25 the base member 21 and tightened the two conducting strips 38, 39 connect. A conducting pathway is thus formed.

A removable smart card 40 may be attached to the data carrier 3 by snapping respective holes in the smart card 40 over metal studs 34 in the data carrier 3. Incorporated into the smart card 40 is an electronic chip 41. This contains a central processing unit, a clock, a read only memory and a random access memory. It is powered by solar panels 42.

Two of the metal studs 34 in the data carrier 3 are electrically connected to the strips of conducting material 38, 39. A further two are electrically connected to a socket on the cargo container via a plug 43. In this way the smart card can communicate with the conducting strips and communicate with and control associated electronics on the cargo container.

The associated electronics includes a global positioning system (GPS) unit, a radio frequency transmitter and a radio frequency receiver via a bus. It also includes an accelerometer sensor, a radio alarm, a buzzer alarm and a light emitting diode (LED). These electronics are powered by a separate battery also contained with the cargo container.

When the cargo closure 1 is attached to the cargo container it sends an energising signal to the associated electronics to turn the associated electronics on.

The random access memory is programmed before the cargo closure is closed. The sender of the cargo (or alternatively a travel agent for passenger luggage) enters details regarding the cargo on a personal computer (p.c.) running appropriate databasing, encoding and tracking software. This p.c. controls a radio frequency transmitter, used to communicate with a handheld portable device.

Data regarding a large number of cargo containers may be downloaded into the portable electronic device. This contains a transmitter which in

turn is used to send an encoded signal to a receiver on individual cargo containers. Once the cargo closure 1 has been attached to the cargo container and plugged in it the handheld electronic device may be used to send data regarding the cargo container to the random access memory in 5 the electronic chip 41.

A warehouser uses the handheld electronic device to generate an encoded signal, which is transmitted to the cargo closure. The signal contains data which identifies it as a programming signal for a particular cargo closure. When received this is decoded by the CPU and if the cargo closure is the 10 one designated by the signal, the data contained in the signal is written by the CPU to the random access memory.

This data includes the name and address of the cargo owner, the sender, and the receiver as well as details of the route that the cargo will take. The names and addresses of the companies responsible for handling the 15 cargo are also written into the random access memory, together with details of any other cargo closures that the container is being dispatched with. The timescale of the journey, including any different stages, forms part of the data transmitted. Furthermore the contents of the container, the nature of these contents and any special handling instructions are 20 written into the random access memory. The chip 41 may be programmed to check the nature of the contents and will light the LED if the cargo contents are hazardous. If the contents are perishable the best before date will be noted by the chip 41 and an event trigger for an alarm set up so that the buzzer may be sounded if the contents are delayed for too long.

25 The warehouser then closes the cargo closure and depresses a button on the smart card in order to activate the security features on the cargo closure 1. The cargo closure 1 then starts its anti-tampering and tracking operations described further below. Alternatively the smart card 40 may

be activated by the act of folding over the data carrier 3 and connecting the metal studs 34 to the respective pair of metal studs on the other half of the data carrier 3. These may form a conducting pathway that will change the resistance between metal studs 34 in way which is detectable by the 5 CPU.

Upon closure of the cargo carriers the existence of the conducting pathway formed by the conducting strips 38, 39 is also registered by chip incorporated into the data carrier.

10 The cargo container is then dispatched. It is handed over to a first handling company. One of their cargo dispatchers uses a similar handheld electronic device to transmits a coded signal to the chip. This signifies that they have received the cargo container. Similarly the second handling company registers their responsibility for the cargo with the chip. The chip records the date and time of each handover.

15 The chip regularly compares the current date and time with its expected date and time for finishing that stage of the journey and with a best before date if the goods are perishable. If these are exceeded by a pre-determined amount it will generate an alarm.

20 Employees of the handling companies may record the details of the cargo containers that they are carrying. The handheld electronic device is used to generate an activating signal which is recognised by all cargo closures. The electronic device may be programmed to issue different types of activating signal to selectively interrogate the electronic chip 41 of each cargo closure. Alternatively a simple download of all information may be 25 requested.

The cargo closure first identifies the handling company, from information contained in the activating signal. The electronic chip 41 may be

programmed to restrict the information downloaded to a handling company, for example to maintain the confidentiality of information programmed in by other handling companies. Upon emission of the activating signal the cargo closure downloads selected fields of its data via

5 the electronic transmitter to the handheld electronic device. If the cargo closure is delayed or lost it will also sound an alarm when activated.

The information on the handheld electronic device may then be downloaded into a personal computer with appropriate databasing and tracking software. The handling company may thus identify mistakes and

10 optimise their operations.

During the journey the chip also continually measures the voltage of the pathway. Unexpected severing of the conducting pathway causes an open circuit. The chip then consults the GPS system. If it is at its delivery location it may be programmed to not sound the buzzer. Otherwise it is

15 probable that the cargo closure has been tampered with and the chip activates the buzzer alarm, and to flash the light emitting diode on and off. It will also activate a radio alarm to inform any receiving units of its location and that it has been tampered with.

Alternatively the alarm could be sounded unless the chip has received a

20 coded signal indicating that it has reached its delivery location. The maintenance of the connection between the plug 43 and the socket on the cargo container could also or alternatively be used as a trigger to generate an alarm.

As well as the buzzer alarm function the chip uses the GPS system to

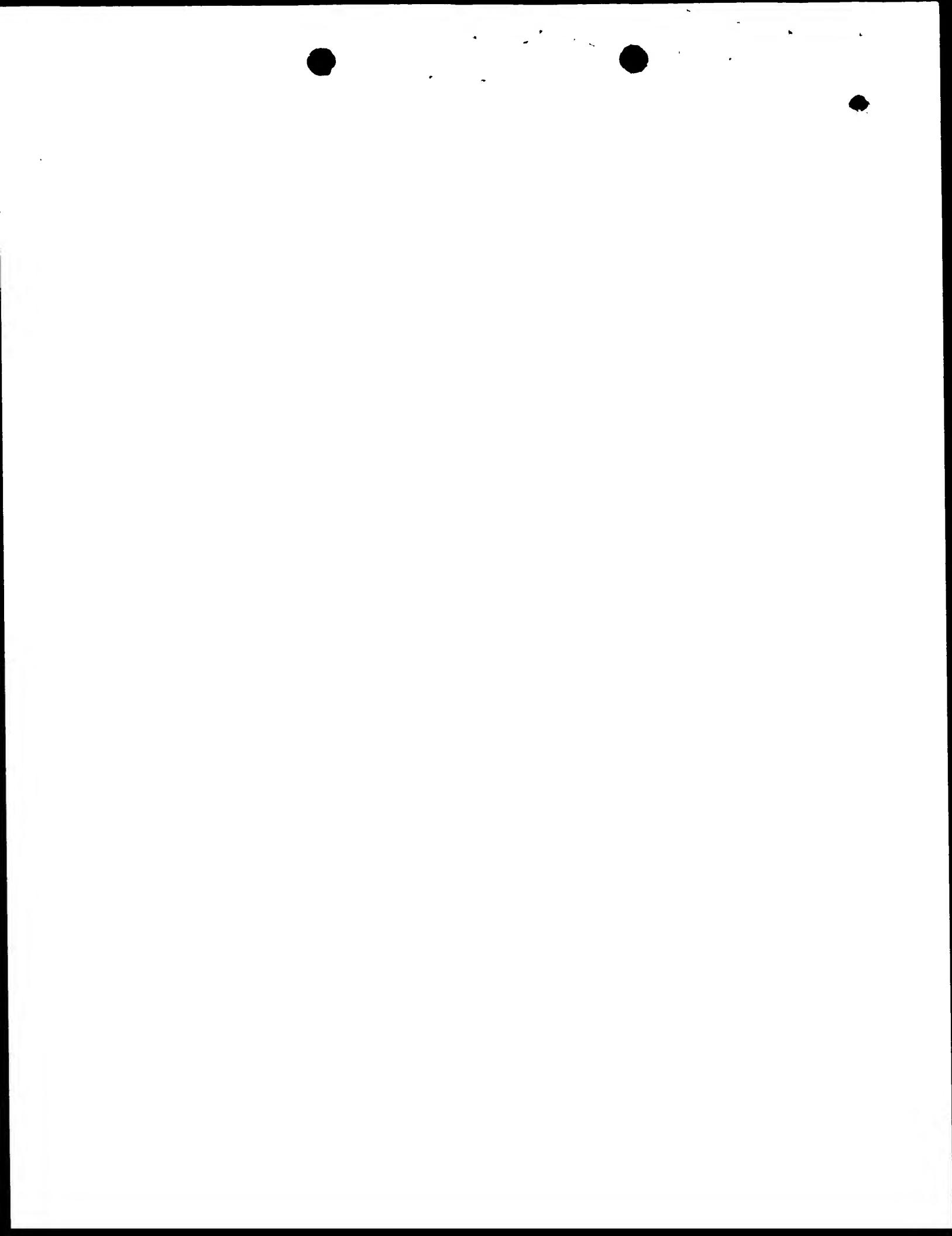
25 determine its location and continually or intermittently generates a signal containing this information. A concerned person may use an appropriate receiving device to locate the lost or tampered with cargo.

Another use of the associated electronics is to achieve a buddy system. The transmitter constantly or intermittently transmits a coded signal unique to the particular cargo closure. This may be picked up by the receiver in nearby similarly equipped cargo closures. The chip regularly, 5 for example every five to ten minutes, registers incoming signals and compares them to codes stored in the memory which identify accompanying cargo containers. If a cargo container is not present for three consecutive scans the chip activates the buzzer alarm. A less intrusive alarm is sounded than for the tampering case, and the alarm may 10 be turned off by depressing the button three times in quick succession. The chip stores information regarding when it was separated from and when it was reunited with cargo closures in the random access memory.

Data sensed and transduced by the accelerometer sensor is also recorded by the electronic chip 41. This can be used to ascertain if the cargo has 15 been subjected to rough handling. An alarm may be programmed to sound if handling has been too rough.

At the end of the journey the recipient of the cargo container activates the closure and downloads the information regarding the journey details to a central databasing system. The recipient also generates a coded signal 20 which when received by the cargo container deactivates the security features.

In this way the cargo may be easily and conveniently be kept safe and the likelihood of security problems and other mishaps reduced. Furthermore any actual mishaps can be registered and located rapidly which is of great 25 assistance in taking any remedial action or tracing and apprehending culprits.



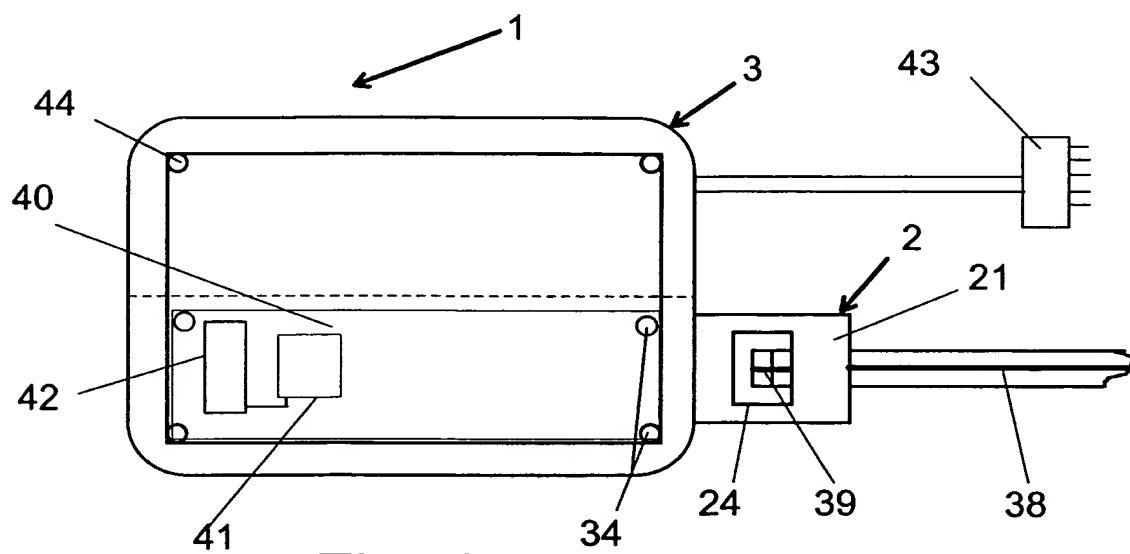


Fig. 4

